Low-dimensional silicon nanowire (SiNW) conductance model

Abstract

To keep downscaling on the track, the introduced of new structure such as Silicon Nanowire (SiNW) is necessary and appear to be the next step to pursue. Based on the new structures, quantum effects will be dominant and analytical analysis need to be done. SiNW with diameter in the range of free electron De-Broglie wave length indicates one-dimensional behaviour because of quantum confinement effect. In this research low dimensional analytical model to capture the effects of conductance based on it channel length and temperature effect are explored. Based on the presented model, the SiNW conductance with channel length, L of 10 nm is investigated. When increased the L, neutrality point will be shifted down due to the restricted freedom of carrier scattering and reduced conductance. In contrast, the temperature does not affect conductance value out of neutrality point. Finally, the comparison study between presented model and published data is obtained and adequate agreement is reported.